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(71) Applicant: **Cellular Process Chemistry Inc.  
Richland, Washington 99352 (US)**

(72) Inventors:  
• **Schwalbe, Thomas, Dr.**  
61118 Bad Vilbel (DE)  
• **Golbig, Klaus, Dr.**  
55296 Harxheim (DE)

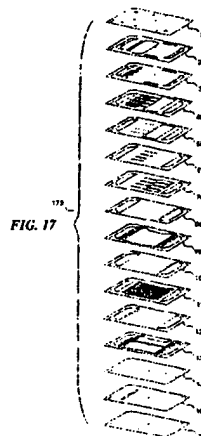
• **Hohmann, Michael, Dr.**  
64287 Darmstadt (DE)  
• **Georg, Petra**  
60326 Frankfurt (DE)  
• **Oberbeck, Andreas**  
35781 Weilburg (DE)  
• **Dittmann, Bernd**  
65843 Sulzbach (DE)  
• **Stastna, Jiri**  
65760 Eschborn (DE)  
• **Oberbeck, Sebastian**  
35753 Greifenstein (DE)

(74) Representative: **Kompter, Hans-Michael**  
Spessarttring 63  
64257 Darmstadt (DE)

(54) **Miniaturized reaction apparatus**

(57) A stacked plate chemical reactor in which simple plates, each incorporating no surface features other than an opening, are stacked together. When openings in adjacent plates are properly aligned, a fluid pathway is defined between inlet ports for each chemical reactant and an outlet port for a chemical product. In one embodiment of the invention, sixteen simple plates are stacked to provide a reactor incorporating three heat transfer fluid pathways, two reactant fluid pathways, one product fluid pathway, multiple mixing chambers, multiple reaction chambers, two reactant pretreatment heat exchangers, two reaction chamber heat exchangers, and multiple temperature sensor pathways. Precise dimensional control of the reactant fluid pathway height enables stacked laminar flow paths for the reactants to be achieved, allowing efficient and rapid diffusion mixing to occur. Because the simple plates incorporate no features other than openings, fabrication of such plates is easily achieved. Different reactor designs, having additional reactant pathways, more or fewer heat transfer fluid pathways, more or fewer heat exchangers, more or fewer mixing chambers, more or fewer reaction chambers, and more or fewer sensor pathways can readily be achieved by adding or removing plates from the stack, and/or by changing the pattern and number

of openings in the simple plates that are used. The simple plates can be held in the stack during use of the chemical reactor using pressure exerted on opposite outer simple plates of the stack, or can be permanently joined. A preferred material for the fabrication of the plates is stainless steel, although other materials such as glass, plastic, and other metals can alternatively be used, which are compatible with the selected reactants and the desired product.



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# EUROPEAN SEARCH REPORT

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